

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

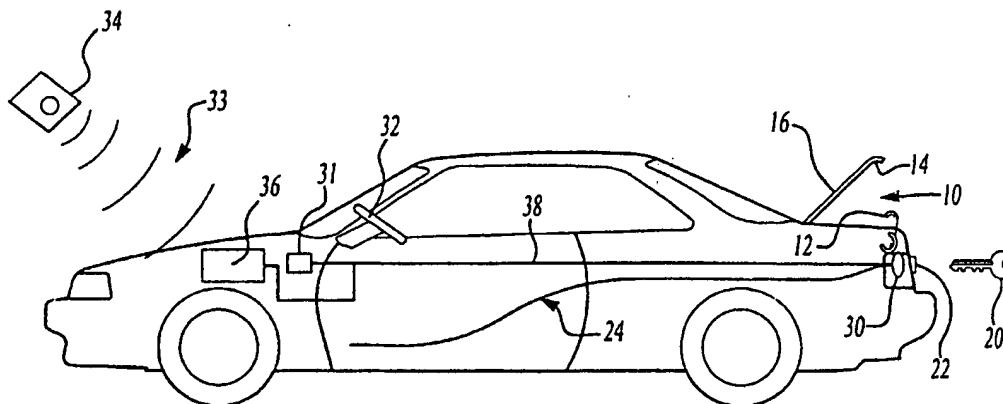


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : E05B 65/19, G01S 13/56, B60R 25/00	A1	(11) International Publication Number: WO 00/58584 (43) International Publication Date: 5 October 2000 (05.10.00)
---	----	--

(21) International Application Number: PCT/US00/08815 (22) International Filing Date: 31 March 2000 (31.03.00) (30) Priority Data: 60/127,031 31 March 1999 (31.03.99) US (71) Applicant: SIEMENS AUTOMOTIVE CORPORATION [US/US]; 2400 Executive Hills Drive, Auburn Hills, MI 48326-2980 (US). (72) Inventors: GARRETT, Sharon, Richards; 2795 Patrick Henry Drive #627, Auburn Hills, MI 48326 (US). TALBOT, David; 3872 Bald Mountain Road, Lake Orion, MI 48323 (US). BONHOURE, Francis; 5546 Sunnycrest Drive, West Bloomfield, MI 48323 (US). WANG, Wenhua; 2082 Rookery Drive, Rochester Hills, MI 48309 (US). KREMER, Maria; 20745 33 Mile Road, Armada, MI 48005 (US). (74) Agent: SLENZAK, Laura, M.; Siemens Automotive Corporation, c/o Elsa Keller, Siemens Corporation, 186 Wood Avenue South, Iselin, NJ 08830 (US).	(81) Designated States: JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. can't use
--	--

(54) Title: AUTOMATIC AUTOMOBILE TRUNK RELEASE SYSTEM AND METHOD



(57) Abstract

This invention relates to a system and method for detecting the likely presence of a warm, animate body in a latched confined compartment such as a vehicle trunk, and for taking automatic action in such situations.

page 7
uses ultrasonic detector to
detect breathing

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

AUTOMATIC AUTOMOBILE TRUNK RELEASE SYSTEM AND METHOD

Cross-Reference to Related Applications

This application is a continuation of, and claims priority from, US Provisional Application 60/127,031, filed 31 March 1999.

5 BACKGROUND OF THE INVENTION

Technical Field of the Invention

This invention relates to a system and method for detecting the likely presence of a warm, animate body in a latched confined compartment such as a vehicle trunk, and for taking automatic action in such situations.

10 Background Information and Description of the Related Art (Including Information Disclosed Under 37 CFR §§1.97 and 1.98)

Automobile trunks are typically unlatched by using a key or wireless remote from the outside of the automobile, or by actuating a trunk release mechanism from inside the passenger compartment. Until recently, there were no means for releasing the trunk latch from inside the trunk compartment. Now, some manufacturers are providing manual release levers actuable from inside the trunk compartment, such as can be found in US Patents 6,018,292, 5,711,559, 5,445,326, 4,155,233 4,080,812, and 3,992,909. Others are looking to automated means, such as found in US Patents 5,859,479.

20 BRIEF SUMMARY OF THE INVENTION

The present invention is directed to a system and method for causing a vehicle trunk compartment to be automatically unlatched when it is suspected that a person or other living being may have become inadvertently confined.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a diagram of a typical vehicle;

FIG. 2 is a diagram of a vehicle trunk having features of the present invention;

5 FIG. 3 is a functional diagram of a preferred embodiment; and

FIG. 4 is a simplified flow chart.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

As shown generally in FIG. 1, most automobiles have a trunk 10, typically located at the rear of the vehicle. A person ordinarily gains access to the interior of the trunk by disengaging a trunk latch 12 from a trunk striker bolt 14, causing the trunk lid 16 to open. Inserting and turning a key 20 within the lock cylinder 22 is one well-known mechanism for releasing the trunk latch. Likewise, one could attach a cable 24 to the latch release mechanism, so that pulling the cable causes the trunk latch to release the striker.

Many automobiles also provide an electrical device 30, such as a solenoid or motor, to drive the latch out of engagement with the striker. As such, a user can press a trunk release button 31 at a remote location, such as near the steering wheel 32, to open the trunk lid.

Remote keyless entry systems build upon this feature by allowing the user to send a radio or infrared trunk release signal 33 from a wireless transmitter 34 to the automobile. A controller 36 of the automobile receives the unlatch signal, and the trunk latch 12 is released. This is generally accomplished by the controller 36

5 sending an unlatch signal via an electrical connection 38 to the electric device 30, to drive the latch out of engagement with the striker.

The operation of all of these latch release schemes are well-known within the art, and need not be described in any greater detail for the purposes of understanding the present invention. The preferred embodiment described here

10 assumes there is some form of electrically actuatable release mechanism, so that the trunk can be unlatched using other than manual means.

FIG. 2 depicts the interior of an exemplary vehicle trunk. Infrared sensors 50, 52 are mounted within the trunk compartment. These sensors detect variations in heat and movement. The sensors 50, 52 are electrically connected 54, 56 to the vehicle electrical system so as to receive power and return signals representative of their sensed values. Each sensor senses heat and motion within its field of vision. These fields of vision are figuratively depicted as detection array vectors 58 and 59. Sensors for detecting heat variations and motion are well-known in the art, and their precise operation need not be detailed here to understand the present invention. The sensors 50, 52 are aimed so that their fields of vision 58, 59 adequately entail the majority of the trunk compartment. In this way, anything (larger than a nominal size) contained within the trunk compartment would fall within the field of one or more of the sensors. As can be appreciated by those of ordinary skill, while this embodiment depicts two sensors located at diametric corners of the trunk, more or fewer sensors located in similar or different positions could be used to suit the needs of the particular situation.

FIG. 3 depicts the function of the preferred embodiment of the present invention. The trunk release controller 36 is electrically connected 38 to the trunk latch solenoid 30. When energized, the solenoid 30 causes the trunk latch 12 to be moved, releasing the trunk lid. The solenoid is operated under normal conditions by one of two means. Depressing a trunk release button 31 directly energizes the solenoid 30. The other method of actuating the solenoid is by emitting an unlatch signal 33 from a transmitter 34, which is received by the trunk controller 36. The trunk controller 36 then energizes the solenoid 30.

To unlatch the trunk automatically, at least one of the heat and motion sensors 50, 52 must detect the likely presence of a warm or moving object. The detection signal is electrically transmitted 54, 56 to the trunk controller 36, and the solenoid 30 is energized to release the latch 12.

5 The goal of the present invention is to automatically unlatch the trunk only when it is likely that there is a person or animal accidentally trapped within the trunk. If only detected motion were required to effect an automatic trunk release, there may be situations where the trunk would unlatch when it is in fact less likely that there is something animate trapped within. For example, inanimate contents of the trunk
10 may shift while the vehicle is in motion. To avoid inadvertently unlatching the trunk due to the shifting of inanimate objects, the preferred embodiment includes a connection 98 whereby a velocity or acceleration signal is provided to the trunk controller 36. This connection 98 interfaces to the engine or body controller 100, which is responsible (among other things) for processing signals such as wheel
15 speed 102, vehicle acceleration 104 and engine speed 106.

FIG. 4 shows a simplified flow chart of an algorithm for effecting the preferred embodiment. The automatic release features are not yet invoked when the vehicle is in motion if only movement, and no heat signature, is detected within the trunk. This is shown as logic path 200, 202, 204, 206, 208. On the other hand, heat and movement signatures detected during vehicle movement would result in the controller 36 setting the unlatch signal. This is shown as logic path 200, 202, 204, 210. The automatic release could be effected immediately, however in this embodiment it is temporarily inhibited until the vehicle speed has fallen below a desired threshold. This is logic path 210, 212. Employing an inhibition threshold would avoid opening the trunk when the vehicle is traveling at high speeds. During successive iterations, the temporarily inhibited unlatch command would be effected as soon as the vehicle speed falls below the threshold. This is logic path 214, 216, 212, 218.

The present invention also is adapted to handle situations where the trapped person or animal falls unconscious, and thus becomes inanimate, before the controller 36 can effect an unlatch signal 38. In those situations, mere detection of an appropriate heat signature is sufficient to effect unlatching. This is logic path 202, 220. During successive iterations, earlier detected movement while the vehicle is in motion is combined with any detected heat signature. If a heat signature is then detected, an unlatch is requested. This is logic path 214, 222, 220, 210. Then, depending upon whether the vehicle speed is above or below the threshold 212, the trunk is unlatched.

One of ordinary skill can appreciate that the sensors 50, 52 could alternatively be ultrasonic and designed to detect an acoustic signature representative of breathing. Likewise, the sensors could alternatively be carbon dioxide/oxygen sensors designed to detect the falling oxygen levels and rising carbon dioxide levels typical of someone or something breathing in a confined

space. In the alternative, or in combination with any of the above, touch sensors

One of ordinary skill would be able to readily adapt the embodiment disclosed here, without engaging in undue experimentation, to employ these and other types of sensors.

CLAIMS

I/we claim as follows:

1. An emergency trunk latch release system for a trunk having a trunk lid and a latch for locking the trunk lid closed, the system comprising:
 - an electromechanical trunk latch release for releasing the trunk latch;
 - a sensor for sensing a person inside the trunk; and
 - 5 a controller connected to said trunk latch release and said sensor; said controller being constructed and arranged to activate said electromechanical trunk latch release upon said sensor sensing a person inside the trunk.
2. An emergency trunk latch release system as claimed in claim 1, wherein said trunk is part of a motor vehicle, said motor vehicle having a vehicle motion sensor connected to said controller, wherein said controller activates said electromechanical trunk latch release only when said vehicle motion sensor senses that said vehicle is
5 at rest.
3. An emergency trunk latch release system as claimed in claim 1, wherein said sensor comprises a motion sensor for detecting motion within said trunk.
4. An emergency trunk latch release system as claimed in claim 3, wherein said motion sensor further comprises a heat sensor.

5. An emergency trunk latch release system as claimed in claim 1, wherein said electromechanical trunk latch release has a manual release lock, and the latch release system overrides said manual release lock when activating said latch release.

6. A method for releasing a motor vehicle trunk latch when a person is trapped in the trunk, the method comprising:

electronically sensing the presence of a person in the trunk;

5 after said sensing the presence of a person in the trunk, electronically activating an electromechanical trunk latch release to release the vehicle trunk latch.

7. A method as claimed in claim 6, wherein said step of sensing the presence of a person in the trunk comprises sensing motion of the person.

8. A method as claimed in claim 7, wherein said step of sensing the presence of a person in the trunk further comprises sensing heat radiating from the person.

9. A method as claimed in claim 6, further comprising the step of sensing that the vehicle is at rest, wherein said step of activating an electromechanical trunk latch release is performed after said sensing that the vehicle is at rest.

10. A system for detecting the presence of a victim trapped in a motor vehicle trunk, the system comprising:
- a sensor for sensing the victim inside the trunk;
 - a rescue mechanism for initiating a rescue of the victim; and
 - 5 a controller connected to said rescue mechanism and said sensor; said controller being constructed and arranged to activate said rescue mechanism upon said sensor sensing a person inside the trunk.
11. A system as claimed in claim 10, wherein said rescue mechanism is a vehicle security alarm.
12. A system as claimed in claim 10, wherein said rescue mechanism is an electromechanical trunk latch release.
13. A system as claimed in claim 10, wherein said rescue mechanism is an electromechanical trunk latch release in conjunction with a vehicle security alarm.

1/2

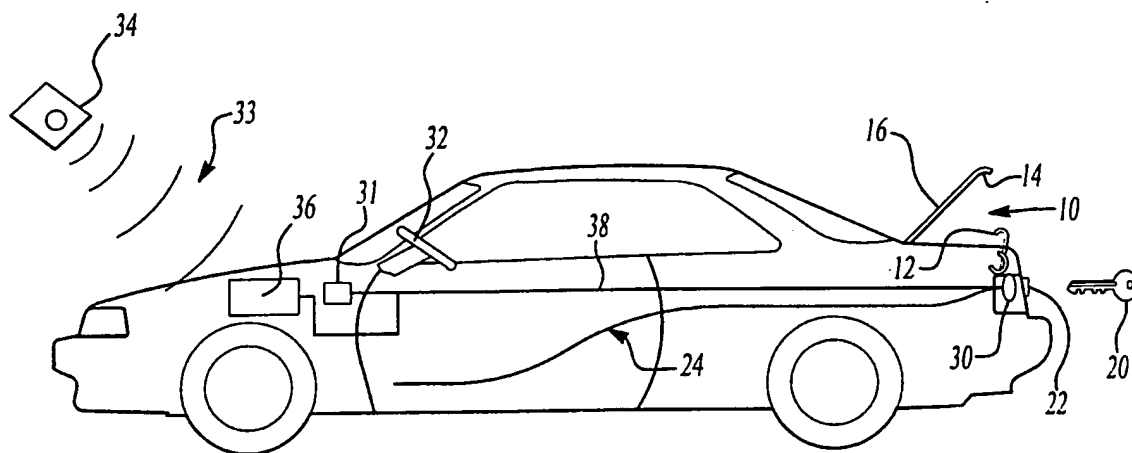


Fig-1

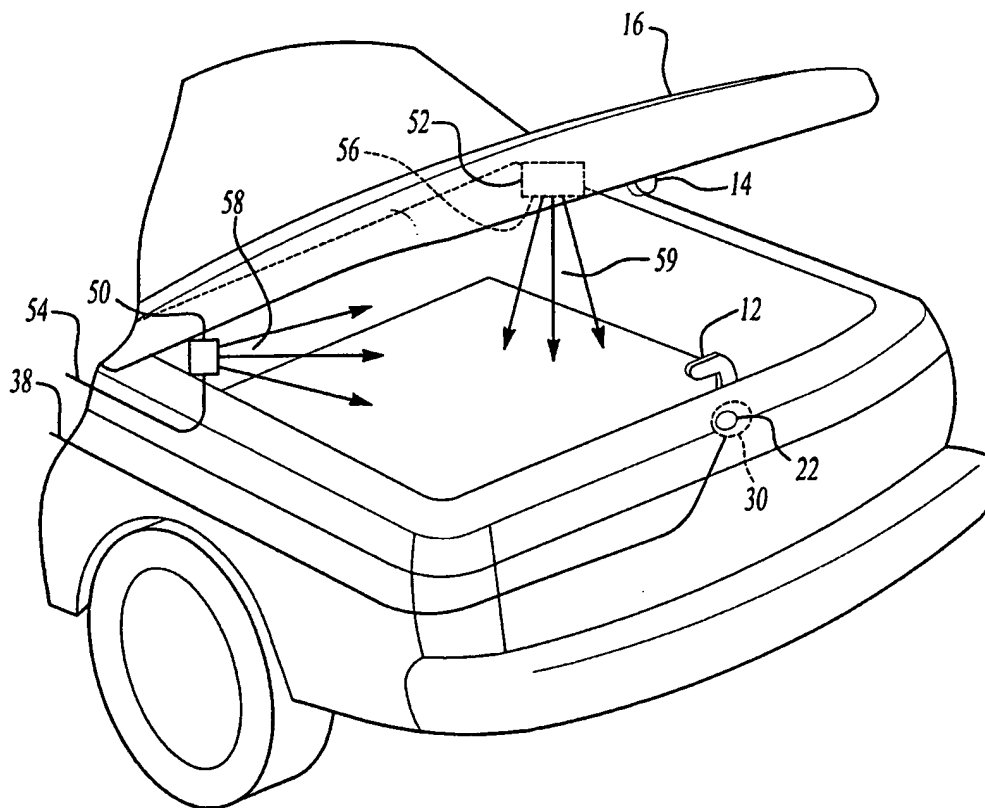
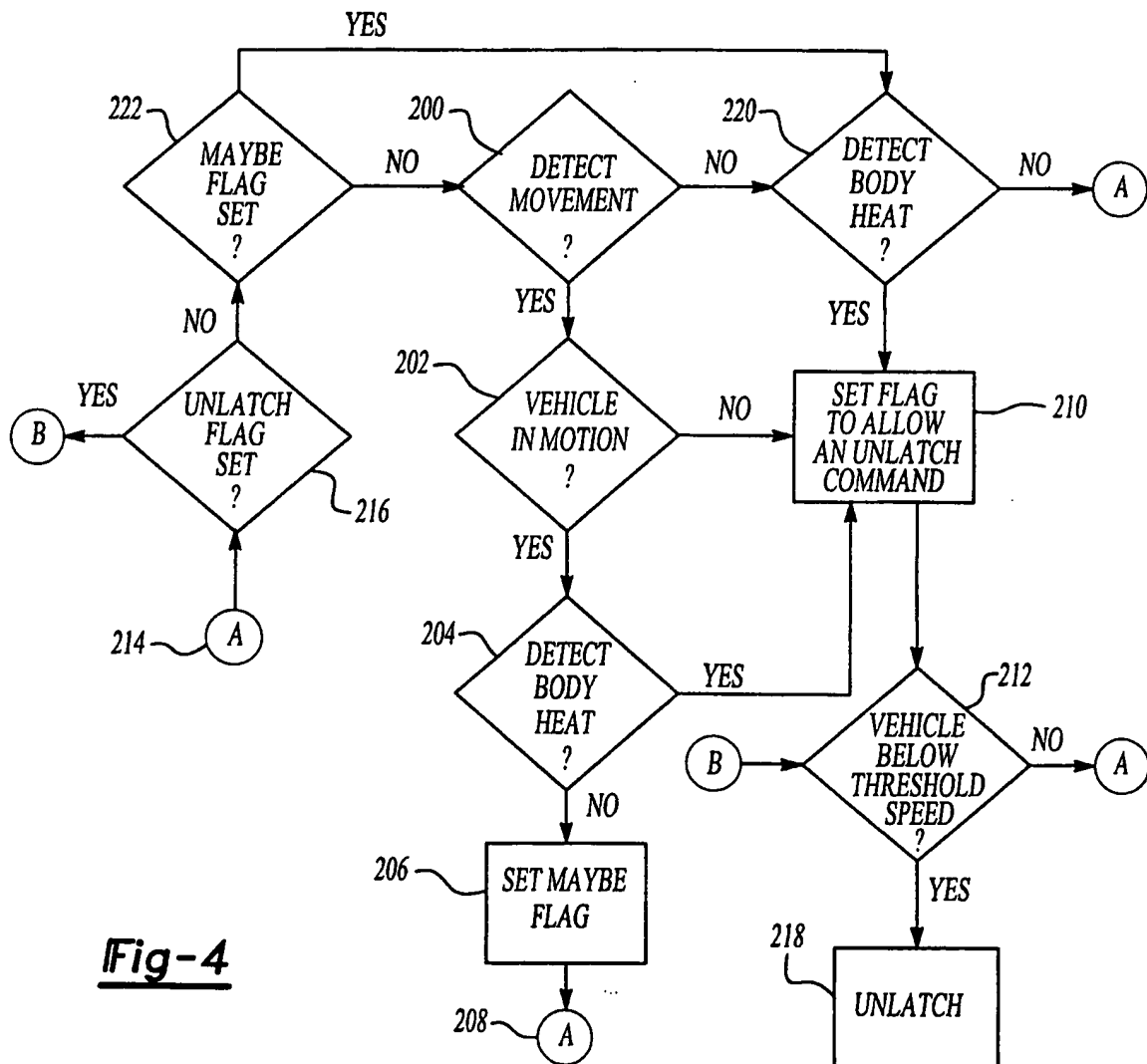
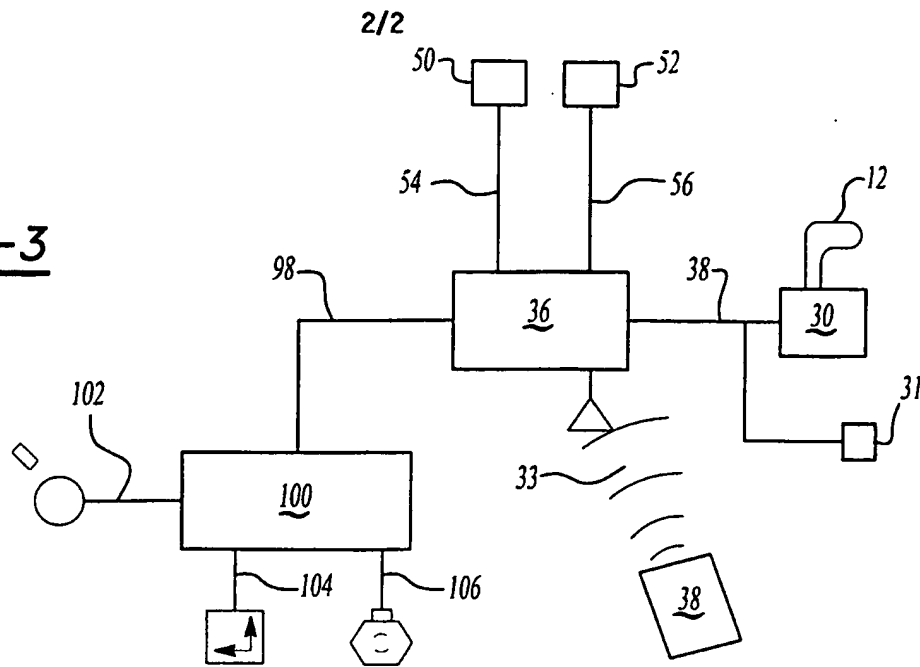


Fig-2

Fig-3**Fig-4**

INTERNATIONAL SEARCH REPORT

Inter. .onal Application No

PCT/US 00/08815

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 E05B65/19 G01S13/56 B60R25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B60R E05B G01S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 04119 A (KIM SEONG SOO) 28 January 1999 (1999-01-28) page 8, line 21 -page 13, line 12 page 23, line 8 - line 13 page 25, line 27 -page 26, line 29; figure 2 ---	1-13
P,X	DE 198 36 935 C (LANGENBERG HARTWIG) 30 March 2000 (2000-03-30) column 1, line 37 -column 2, line 44; claims 1-4; figure 3 ---	1,3-8, 10-13
A	US 5 793 291 A (THORNTON CAROLYN M) 11 August 1998 (1998-08-11) column 1, line 58 -column 2, line 9; figure 2 --- -/--	1,3-8



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 September 2000

Date of mailing of the international search report

13/09/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Eklblom, H

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/08815

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 859 479 A (DAVID ELLIS MORTON) 12 January 1999 (1999-01-12) cited in the application column 3, line 16 -column 4, line 14; figure 2</p> <p style="text-align: center;">-----</p>	1,6,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/08815

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9904119 A	28-01-1999	AU 8463898 A CN 1239530 T JP 2000503738 T	10-02-1999 22-12-1999 28-03-2000
DE 19836935 C	30-03-2000	NONE	
US 5793291 A	11-08-1998	NONE	
US 5859479 A	12-01-1999	NONE	

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☒ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☒ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☒ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.